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Press Kit

Project SCATHA

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(NASA-News-Release-79-3) SATELLITE TO STUDY ELECTRICAL PROBLEMS (National Aeronautics and Space Administration) 10 p N79-73480

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Dave Garrett
Headquarters, Washington, D.C.
(Phone: 202/755-3090)

Donald E. Witten
Goddard Space Flight Center, Greenbelt, Md.
(Phone: 301/344-8955)

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SATELLITE TO STUDY ELECTRICAL PROBLEMS

Possible remedies for electrical static discharges that have disabled or affected high-altitude satellites will be studied with an Air Force satellite to be launched by NASA from Cape Canaveral, Fla., no earlier than Jan. 25. Launch window for that day extends from 5:02 to 5:21 p.m. EST.

Named SCATHA (Spacecraft Charging at High Altitudes), the 659-kilograms (1,452-pound) satellite will lift off atop a Delta launch vehicle. The Air Force will reimburse NASA $8.9 million for the launch vehicle and services.

Most space-related electrical charging problems have been observed on satellites at the geosynchronous orbital altitude of 35,900 kilometers (22,300 miles). Satellites in such an orbit remain over the same spot on the Earth's equator. This is because the satellite's velocity is synchronized with the Earth's 24-hour period of rotation.

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Electrical arcing in commercial and military communications satellites at the geosynchronous altitude is known to have been responsible for equipment failures. Such arcing also has caused switches to operate, resulting in the false recording of unachieved events as well as the initiation of unplanned events.

The orbit selected for SCATHA experiments will carry the research satellite above and below the geosynchronous orbital altitude as well as north and south of the equatorial plane. It also will allow the vehicle to drift eastward around the globe about 6 degrees a day.

This elliptical SCATHA orbit will have an apogee of 42,306 km (26,859 mi.), a perigee of 27,780 km (17,262 mi.), and will be inclined 8.3 degrees to the equator. Due to this inclination, the satellite will seem to draw a lazy figure eight pattern in space.

The SCATHA satellite carries 12 experiments designed to identify and measure sources of electrical charge buildup on the spacecraft. They also will measure the electrical charging levels and rates of some 20 metals and insulation devices, including types previously used as well as some new to the fabrication of spacecraft.

Three SCATHA experiments are provided by NASA. These include a mass spectrometer from the Marshall Space Flight Center, Huntsville, Ala., along with a precise magnetometer and an electric field detector from the Goddard Space Flight Center, Greenbelt, Md.

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Project engineers will keep a close eye on the deployment of Goddard's electric field detector due to its possible affect on the dynamics of the satellite. This unit consists of two 50-meter (164-foot)-long antennas which will be extended in opposite directions to form a single line antenna longer than a football field.

The electric field detector antenna will be deployed to its full length in mid-March, just prior to the time when the SCATHA satellite will begin to experience daily eclipses of the Sun by the Earth. Most serious electrical charging events on spacecraft have occurred during such periods of eclipse. Sunlight reduces the electrical-charging phenomena.

The spring eclipse period for the SCATHA satellite will begin March 20 and last about 44 days. The maximum period of any daily eclipse for the orbiting spacecraft will last 71 minutes.

Another eclipse period will be encountered by the satellite next fall.

In addition to direct application in the design of satellites operating at the geosynchronous orbit, data from the SCATHA program may be vital to NASA's long-range plans. Large-scale satellite structures being considered for fabrication in space during the 21st century will operate at high power levels. Spacecraft charging problems could be particularly significant for such structures.

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Other sponsors of SCATHA experiments are the Air Force Space and Missile Systems Organization (SAMSO), the Air Force Geophysics Lab, and the Office of Naval Research (ONR).

The SCATHA satellite was developed for SAMSO, Air Force Systems Command, Los Angeles Air Force Station, Calif., by Martin Marietta Aerospace Corp., Denver, Colo.

The Delta launch vehicle program is managed by the Goddard center, for NASA's Office of Space Transportation Systems. NASA's Kennedy Space Center, Fla., manages launch operations. Prime contractor for the Delta and for launch operations is McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

(END OF GENERAL RELEASE. BACKGROUND INFORMATION FOLLOWS)

Principal Investigators/Sponsors

Experiment Title	PI/Sponsor	Affiliation
Engineering Experiments	Dr. H. C. Koons USAF/AFSC/SAMSO	The Aerospace Corp. Los Angeles, Calif.
Spacecraft Sheath Electric Fields	Dr. J. F. Fennell USAF/AFSC/SAMSO	The Aerospace Corp. Los Angeles, Calif.
High Energy Particle Spectrometer	Dr. J. B. Reagan ONR	Lockheed Palo Alto Research Lab, Palo Alto, Calif.
Satellite Electron and Positive Ion Beam System	Dr. H. A. Cohen USAF/AFC	Hanscom AFB/LKB Bedford, Mass.
Rapid Scan Particle Detector	Lt. D. Hardy USAF/AFSC	Hanscom AFB/PHE Bedford, Mass.
Thermal Plasma Analyzer	Dr. R. C. Sagalyn USAF/AFSC	Hanscom AFB/PHR Bedford, Mass.
Light Ion Mass Spectrometer	Dr. D. L. Reasoner NASA/ONR	NASA Marshall Space Flight Center Huntsville, Ala.
Energetic Ion Composition Experiment	Dr. R. G. Johnson ONR	Lockheed Palo Alto Research Lab, Palo Alto, Calif.
UCSD Charged Particle Experiment	Dr. S. E. Deforest ONR/USAF/AFSC/ SAMSO	University of California, Dept. of Physics, La Jolla, Calif.
Electric Field Detector	Dr. T. L. Aggson NASA	NASA Goddard Space Flight Center, Greenbelt, Md.
Magnetic Field Monitor	Dr. B. G. Ledley NASA	NASA Goddard Space Flight Center, Greenbelt, Md.
Spacecraft Contamination	Dr. D. F. Hall USAF/AFSC/AFML	The Aerospace Corp. Los Angeles, Calif.

Delta Launch Vehicle 2914:Statistics

The SCATHA spacecraft will be launched by a three-stage Delta 2914 launch vehicle. This launching will be the 148th for the Delta which has a success performance record of more than 90 per cent. The launch vehicle has the following general characteristics:

Height: 35.4 m (116 ft.) including shroud

Maximum diameter: 2.4 m (8 ft.) without attached solids

Liftoff weight: 131,895 kg (293,100 lb.)

Liftoff thrust: 1,765,315 newtons (396,700 lb.) including strap-on solids

First Stage:

An extended long-tank Thor, produced by McDonnell Douglas, has RS-27 engines produced by the Rocketdyne Division of Rockwell International. This stage has the following characteristics:

Height: 21.3 m (70 ft.)

Diameter: 2.4 m (8 ft.)

Propellants: RJ-1 kerosene as the fuel and liquid oxygen (LOX) as the oxidizer

Thrust: 912,000 N (205,000 lb.)

Strap-on solids consist of 9 TMX-354-5 Castor II solid-propellant rockets produced by the Thiokol Chemical Corp. with the following features:

Height: 7 m (23 ft.)

Diameter: 0.8 m (31 in.)

Propellants: Solid

Thrust: 2,083,000 N (468,000 lb.) for nine
231,400 N (52,000 lb.) for each

Second Stage:

Produced by McDonnell, this uses a TRW TR-201 rocket engine; major contractors for the vehicle inertial guidance system located on the second stage are McDonnell Douglas and Delco. The second stage has the following characteristics:

Height: 6.4 m (21 ft.)

Diameter: 1.5 m (5 ft.)

Propellants: Liquid Aerozene 50 for the fuel and nitrogen tetroxide (N_2O_4) for the oxidizer

Thrust: About 42,943 N (9,650 lb.)

Third Stage:

A TE-364-4 motor produced by Thiokol Chemical Corp., with the following characteristics:

Height: 1.4 m (4.5 ft.)

Diameter: 1 m (3 ft.)

Propellants: Solid

Thrust: 61,855 N (13,900 lb.)

Launch Operations

The Kennedy Space Center's Expendable Vehicles Directorate handles the preparation and launch of the thrust-augmented Delta rocket that will carry the SCATHA spacecraft.

Delta 148 will be launched from Pad B, southernmost of the two launch pads at Complex 17, Cape Canaveral Air Force Station.

The Delta first stage and interstage were erected on Pad B on Nov. 27. Erection of the nine Castor 2 solid rocket motors around the base of the first stage was accomplished on Nov. 29-30. The second stage was erected atop the first stage on Dec. 1.

The SCATHA spacecraft arrived at KSC on Nov. 7.

NASA/USAF SCATHA Launch Team

NASA Headquarters:

John F. Yardley	Associate Asministrator, Office of Space Transportation Systems
Joseph B. Mahon	Director of Expendable Launch Vehicle Systems, OSTS
Peter T. Eaton	Manager, Delta Program, OSTS

Goddard Space Flight Center:

Dr. Robert S. Cooper	Director
Robert E. Smylie	Deputy Director
Robert N. Lindley	Director, Project Management
Robert Baumann	Associate Director for Space Transportation
David W. Grimes	Delta Project Manager
William R. Russell	Deputy Delta Project Manager, Technical
Robert Goss	Manager, Delta Mission Analysis and Integration
William R. Burrowbridge	NATO II-C Mission Integration Manager
William Hawkins	Mission Operations and Network Support Manager
Ray Mazur	Mission Support

Kennedy Space Center:

Lee R. Scherer	Director
Gerald D. Griffin	Deputy Director
Dr. Walter J. Kapryan	Director of Space Vehicles Operations
George F. Page	Director, Expendable Vehicles
W. C. Thacker	Chief, Delta Operations Division
Wayne L. McCall	Chief Engineer, Delta Operations Division
John J. Dunn	Spacecraft Coordinator

DOD/USAF:

Lt. Col. John Durrett	SCATHA Spacecraft Program Manager USAF/SAMSO

CONTRACTORS

Martin Marietta Aerospace Denver, Colo.	Spacecraft
McDonnell Douglas Astronautics Co. Huntington Beach, Calif.	Delta Launch Vehicle

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SCATHA Launch Sequence of Events

Event	Time	Altitude km	Altitude mi.	Velocity km/hr	Velocity mph
Liftoff	0 sec.	0	0	0	0
Six Solid Motor Burnout	38 sec.	6.1	3.8	1,389	863
Three Solid Motor Ignition	39 sec	6.3	3.9	1,383	859
Three Solid Motor Burnout	1 min. 17 sec.	21.4	13.4	2,930	1,820
Nine Solid Motor Jettison	1 min. 27 sec.	25.9	16	3,216	1,998
Main Engine Cutoff (MECO)	3 min. 45 sec.	92.8	57.7	17,911	11,129
First/Second Stage Separation	3 min. 53 sec.	98.6	61.3	17,935	11,144
Second Stage Ignition	3 min 58 sec.	102	63	17,911	11,129
Fairing Jettison	4 min 37 sec.	125	78	18,555	11,529
Second Stage First Cutoff (SECO-1)	8 min. 52 sec.	157	98	26,747	16,619
Second Stage Restart	21 min. 21 sec.	178	111	26,654	16,561
Second Stage Second Cutoff (SECO-2)	21 min. 34 sec.	178	111	27,233	16,921
Third Stage Spin Up	22 min. 34 sec.	181	112	27,220	16,913
Second/Third Stage Separation	22 min. 36 sec.	182	113	27,220	16,913
Third Stage Ignition	23 min. 17 sec.	185	115	27,207	16,905
Third Stage Burnout	24 min. 1 sec.	191	119	35,723	22,196
Third Stage/Spacecraft Separation	25 min. 10 sec.	228	142	35,599	22,119
Transfer Orbit Apogee	6 hrs. 48 min.	42,781	26,581	8,786	5,459